SOIL SURVEY OF THE DOVER AREA, DELAWARE.

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LOCATION AND BOUNDARIES OF THE AREA.

The northern part of Kent County, Del., considered in the following report, represents a land surface of about 314 square miles embraced within the meridians of 1° 16′ and 1° 38′ longitude east from Washington and parallels 39° 3′ and 39° 22′ north latitude, approximately.

It lies a little north of the central part of the State and is bounded on the north by Newcastle County, Del., on the east by Delaware Bay, and on the west by Kent, Queen Anne, and Caroline counties, Md. The southern boundary is a straight line drawn at a right angle to the State line from near the mouth of St. Jones Creek to the western boundary of the county.

The area surveyed varies from 16 to 21 miles in length and from 16 to 19 miles in breadth. The principal towns are Dover, the State capital, near the center of the area, and Smyrna, near the northern boundary. The population of the county is about 33,000, something more than half this number residing in the northern half.

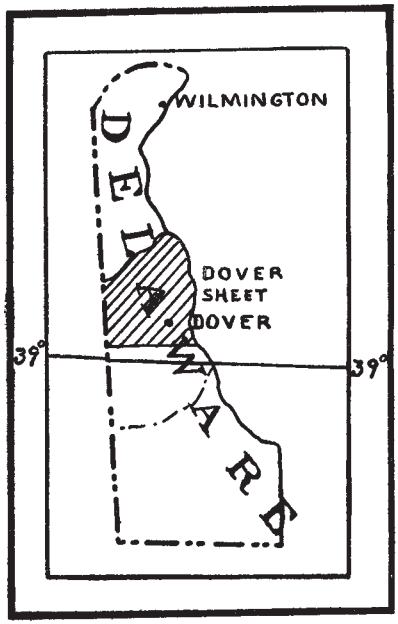

FIG. 5.—Sketch map showing location of the Dover area, Delaware.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Prior to 1674 very little land within the present borders of the State had been taken up, but soon after that year settlers began to come in rapidly, principally from Maryland, and to settle along the streams.

Until Dover was laid out, in 1717, there was not a village of any size in the county. There is no record of the change of name from St. Jones County to Kent County, but it was probably made in 1682

at a meeting between William Penn and the magistrates of Newcastle. On the formation of the county, court was established at Towne Point, at the mouth of St. Jones Creek, where it was held until 1690, when it was transferred to a tavern near the present site of Dover. The general assembly created Dover the capital in 1777.

Prior to the Revolution, Delaware, though maintaining its own assembly, gave allegiance to the governor of Pennsylvania. At this time the assembly selected a governor and declared Delaware an independent State, which became the first to ratify the Constitution of the United States.

Since its earliest settlement agriculture has been the principal occupation of the inhabitants of this region, almost to the exclusion of manufactures and the liberal arts. Tobacco soon became the principal crop and the early medium of exchange, but its culture was gradually abandoned some time before the civil war. Corn has always been an important crop and continues so up to the present day, with a production ranging from 3,000,000 bushels in 1850 up to nearly 5,000,000 bushels in 1900. In production of corn per square mile of her area Delaware ranks eighth among the States, indicating the continued ability of the old States to produce food in proportion to the area. (Bul. No. 24, Division of Statistics, U. S. Dept. Agr.) Oats, which was a crop of some importance prior to 1860, when the total yield for the State reached 1,000,000 bushels, have steadily decreased in acreage until the product in 1900 was but little over 100,000 bushels. Wheat, which has ranked as an important crop since its early introduction, has doubled in total yield since 1870, despite the competition of the Western wheat belt, which has decreased the acreage in so many Eastern States. This result is due more to larger acreage here than to maintenance of the productiveness of the soil, and it is doubtful if wheat growing in this section is as profitable as other systems of farming, and sooner or later it must give way to crops better adapted to the light, sandy soils of this region. An early writer makes the statement that in 1828 seven-tenths of the arable land had been so impoverished by injudicious cropping as to scarcely average 20 bushels of corn or 10 bushels of wheat per acre.

The peach industry, which has made the name of Delaware famous, had developed to importance between 1820 and 1835, but the orchards were then entirely seedlings. The first orchards of budded fruit were set in 1832, and by 1840 there were 600 acres of budded trees. In 1856 many thousand trees had been set out. Later the dreaded peach yellows steadily forced the center of the industry southward. In 1875 it was at Middletown, in 1880 at Smyrna, in 1885 at Wyoming, and in 1890 south of the area under consideration.

Other principal crops are of more recent development and will receive consideration in another chapter.

CLIMATE.

The climate of the Dover area is mild and equable, and well suited to a varied agriculture. The broad reaches of water on both sides of the peninsula tend to equalize the day and night temperatures and to prevent sudden changes and erratic frosts. This has been an important factor in the success attained in the cultivation of peaches and other fruits.

The following table, compiled from records of the Weather Bureau stations at Millsboro and Seaford, shows the normal rainfall and temperature in this region:

Normal monthly and annual temperature and precipitation.

Month.	Millsboro.		Seaford.		Month.	Millsboro.		Seaford.	
	Temperature.	Precipitation.	Temperature.	Precipitation.		Temperature.	Precipitation.	Temperature.	Precipitation.
	° *F.*	*Inches.*	° *F.*	*Inches.*		° *F.*	*Inches.*	° *F.*	*Inches.*
January	33 5	2.90	34.1	3.11	August	75.2	3.90	75.7	3.55
February	33.5	4.45	34.4	4.19	September	68.9	3.18	69.1	2.94
March	43.0	3.55	43.1	3.80	October	57.2	4.69	56.6	3.32
April	52.4	3.58	53.6	3.76	November	47.5	3.04	46.7	3.09
May	63.3	4.13	63.6	4.18	December	38.0	2.90	37.5	2.53
June	71.9	2.96	72.0	2.90	Year	55.1	44.42	55.2	42.16
July	76.4	5.14	76.5	4.79					

The average date of the first killing frost in the fall is October 20, and of the last in spring April 17, while the latest in spring is May 8 and the earliest in fall October 8.

PHYSIOGRAPHY AND GEOLOGY.

The northern half of Kent County, Del., lies on the eastern slope of the low, flat peninsula extending between Delaware and Chesapeake bays. In elevation it ranges from tide level to about 70 feet, a large portion of the area lying near the tide level and having changes of elevation so gradual as to be scarcely perceptible.

Fully three-fourths of the surface is drained in an easterly direction through Duck, Little Duck, and St. Jones creeks and their tributaries to Delaware Bay. These streams are broad and sluggish, flowing in tortuous channels. Tide water enters them for a distance of several miles from the bay, causing considerable areas of marshy land. Narrow strips of low, wet ground border the smaller tributaries almost to their source, where the land surface extends in a broad, level plain which has but recently emerged from the condition of the upland swamps. To secure this result natural drainage has been assisted by cutting large open ditches having scarcely any fall, but this western one-fourth of the area ultimately drains in a southwesterly direction across the

Eastern Shore counties of Maryland, by way of the Chester and Choptank rivers, into Chesapeake Bay.

The broad, level surface is nowhere broken by hills or vales, stream banks throughout the region of their greatest fall rarely presenting a declivity of 15 feet, and the dunelike ridges of sand occurring through the area rarely having an abrupt rise of over 10 feet above the surrounding country.

The surface features can be briefly summed up by the statement that in general the eastern part of the area is a low, poorly drained section but little above mean tide level, the western portion is a higher lying level plateau, likewise poorly drained and much of it still swampy in character, while a broad belt extending in a north and south direction through the central portion, where the stream fall is greatest, is a well-drained, fertile farming section. In this strip lie the most desirable farming soils, and here the important peach and fruit industries have been best developed.

Kent County lies within the great physiographic province known as the Atlantic Coastal Plain and consists of unconsolidated strata of Cenozoic age deposited as marine sediments on a former ocean floor, which by subsequent upheaval has emerged above tide level. How many times such uplifts and depressions have taken place here is a matter of conjecture, but proof is ample of several such occurrences. The basal structure of this entire section is of Neocene period, bearing up a stratum of Pleistocene, which forms a relatively thin cover of gravels, sands, and loams over a greater part of the peninsula. It is this layer which concerns our present report, as from this, by natural weathering processes, all the soils of the area have been derived. These conditions have been modified over a considerable proportion of the county by more recent development of upland swamps and their partial reclamation through artificial drainage, by the formation of tide marshes and the continual sedimentation going on therein, and to a less extent by stream and wind transportation. Owing to the gentle slope throughout the area, soil creep and migration have had little to do with the existing character of the soils. The wide differences in texture between the soils, which have been but little modified since their deposition as marine sediments, is due to the sorting power of water currents of different velocities, and the position of a heavy silty loam or clay in close proximity to a loose wind-blown sand affords a striking example of the selective power of the contending currents, whose ever changing force, direction, and velocity have made these conditions possible. The varying layers of gravel, sand, and silt bear witness to the character of current which transported and laid them down. A thin band of rounded gravel underlies most of the area at from 3 to 10 feet below the surface, and this is in turn underlain by a stratum of fine sand several feet in thickness.

SOILS.

Eight different soil types, exclusive of Swamp and Meadow, are found in the Dover area. All these types have been previously recognized in other areas surveyed in the Coastal Plain region. The following table gives the area of each soil, in the order of extent:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Norfolk loam	66,752	33.2	Meadow	4,096	2.0
Portsmouth sandy loam	50,304	25.0	Swamp	3,712	1.8
Norfolk silt loam	32,960	16.4	Portsmouth sand	640	.3
Galveston clay	30,784	15.3	Galveston sand	64	.0
Elkton clay	6,016	3.0	Total	200,960	.....
Norfolk sand	5,632	2.8			

PORTSMOUTH SAND.

The surface soil of the Portsmouth sand varies in depth from 9 to 14 inches, with an average of 12 inches, and consists of a black, brown, or gray loamy sand containing usually large amounts of organic matter, on which the color and loamy character of the soil depend. When dry it is loose and light, but compacts slightly when wet.

The subsoil to a depth of 36 inches is a gray or mottled drab, white, and yellow sticky sand, becoming coarser and looser in the lower depths, and is underlain at from 24 to 40 inches by a compact, impervious stratum of coarse sand, which keeps the subsoil in a saturated condition. The contrast in color between soil and subsoil is very marked and largely due to bleaching of the latter by acids from the decomposition of the humus in the soil. The soil is locally called "chaffy," as when thoroughly dry it blows badly. On continued cultivation it becomes sandier through loss of organic matter.

It occurs in two comparatively small areas in the southwestern part of the area, most of the upland marsh in this section being occupied by the related type—Portsmouth sandy loam. Many small patches, not large enough to represent on the map, may be found throughout the sandy loam.

The Portsmouth sand presents a nearly level surface, except for slight wind-formed ridges, and is found in the upland portions of the county at an elevation of from 50 to 70 feet above tide.

Lack of drainage is responsible for the existence of the type, and it is in consequence a naturally wet, sour soil, requiring extensive and systematic ditching to bring it into a good state of cultivation.

It was originally laid down as a marine sediment in late Pleistocene time, but has reached its present condition through the development of marsh conditions and the accumulation and partial decay of vegetable remains.

This soil is used principally for corn, and when newly cleared it produces heavy yields without fertilization, although it soon becomes exhausted. It is not suited to wheat and grass, and they are seldom grown. Berries do well and tomatoes give fair yields.

Portsmouth sand is best suited to strawberries, dewberries, and in some areas to onions. It is not adapted to peaches or pears, and is considered a relatively poor soil. It requires further drainage and heavy applications of lime.

The following table shows the texture of typical samples of this soil:

Mechanical analyses of Portsmouth sand.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
9685	4 miles SE. of Willow Grove.	Black loamy sand, 0 to 12 inches.	3.73	0.64	11.30	16.34	44.36	6.76	13.40	6.70
9686	Subsoil of 9685....	Brown loamy sand, 12 to 36 inches.	.41	2.10	15.02	20.66	47.18	5.64	5.40	3.74

PORTSMOUTH SANDY LOAM.

The soil of the Portsmouth sandy loam has an average depth of 10 inches, but varies from 8 to 12 inches, and consists of a black, brown, or gray sandy loam usually rich in organic matter and resembling Portsmouth sand, though containing less sand and much more silt. The organic matter disappears rapidly on continued cultivation and the older fields present a gray, rather compact surface.

The subsoil is a gray or mottled gray, drab, and yellow sandy clay, massive and sticky, resembling the subsoil of Elkton clay in all but the sand content. This is always underlain at depths less than 36 inches by a very sandy substratum, which in turn rests upon the compact and impervious sand hardpan common to most of the upland marsh area of the eastern peninsula. Small areas of slightly greater elevation occur in the type, where from better drainage a decided yellow color has developed in soil and subsoil. These areas are but little inferior in productiveness to the Norfolk loam. Newly cleared land is quite light and inclined to blow when dry. Wheat is thrown out in such areas and can only be grown after the soil has been under cultivation for some time.

Portsmouth sandy loam is one of the most extensive soils in Kent County, and occurs principally as a broad belt in the western part along the Maryland line and in smaller areas where similar drainage conditions have favored its formation and development.

Like the Portsmouth sand, it occupies level or basinlike areas, broken only by slight ridges of Norfolk sand and Norfolk loam. It occurs in the highest elevations in the county on the divide between the Chesapeake and the Delaware drainage. It is almost entirely lacking in natural drainage and has been partially drained by an extensive system of ditches following the natural water courses. There is an ample fall in each direction adequately to drain this large area, and it would seem that some concerted work looking toward this result would be profitable. The mineral constituents of the type were deposited as a marine sediment, but the predominant features are the result of swamp conditions, and atmospheric weathering has been greatly retarded, while chemical changes have been augmented by the liberation of organic acids.

The crop value of the type is naturally quite variable, depending on the extent to which drainage has been accomplished and on the length of time the soil has been under cultivation. It is a fair general-purpose soil, producing medium crops of corn and wheat, averaging perhaps 30 bushels per acre of the former and 13 bushels of the latter. Tomatoes yield from 5 to 8 tons per acre and are extensively grown. Strawberries and dewberries are also important crops. Grass gives only fair crops, yielding about 1 ton of hay per acre.

The Portsmouth sandy loam is best adapted to the production of berries. Bermuda and other hardy grasses make good growth, and more of these should be grown and the land devoted to grazing in connection with the general farming. Further drainage and heavy liming, to correct acidity, are necessary to bring the soil up to its full productive capacity. Onions and celery might profitably be introduced on the more mucky areas.

The following table gives mechanical analyses of typical samples of this soil:

Mechanical analyses of Portsmouth sandy loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to (mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
9690	3 miles SE. of Smyrna.	Fine sandy loam, 0 to 10 inches.	2.09	2.72	16.32	12.32	14.94	6.76	33.50	13.28
9687	3½ miles S. of Hartly.	Fine sandy loam, 0 to 9 inches.	2.12	4.68	14.14	12.50	14.90	6.40	32.62	14.74
9689	Subsoil of 9687.....	Coarse sand, 24 to 40 inches.	.46	2.04	20.14	25.04	33.68	5.80	5.12	8.02
9691	Subsoil of 9690.....	Sandy clay, 10 to 30 inches.	.67	2.24	17.66	11.52	14.72	6.08	31.52	16.20
9688	Subsoil of 9687.....	Sandy clay, 9 to 24 inches.	.48	2.58	12.28	13.28	15.18	6.70	33.44	16.48

NORFOLK SAND.

The surface soil of the Norfolk sand varies in depth from 4 to 10 inches, generally averaging 6 inches, and is a brown medium sand slightly loamy from incorporated vegetable matter. It is rather loose and liable to shift under the influence of wind when bare or subjected to clean cultivation, and many small areas in the county owe their origin to this mode of transportation.

The subsoil, to 3 feet or more, is a yellow or gray sand, loose and incoherent, of medium to coarse texture, and containing no perceptible amount of clay or silt.

The principal occurrences are in the southern and southwestern parts of the area and in numerous small areas scattered through the upland. Its total extent is small, and for this reason it is agriculturally unimportant.

The Norfolk sand occurs in this area as wind-blown knolls and ridges on the level uplands, and as areas lining the valley walls along some of the principal stream courses at the points of their most abrupt fall. It is marked by more undulating topographic features than the other types of the area, and though found at all elevations above tide level each area varies but a few feet, and all the type can be readily tilled. Position, texture, and structure all favor adequate natural drainage. The moisture carrying capacity of the subsoil is only sufficient for special crops or for moderate yields in wet seasons. The conditions in this respect are better where the water table is permanently near the surface.

The mineral components of the Norfolk sand, as in the other types described, were originally deposited as a marine sediment, but the type owes its origin to more recent alluvial and æolian deposition, and in some cases is derived from the outcrop of a sand stratum underlying the other types of the area at no great depth. But little change has taken place, except that caused by the addition of organic matter.

Peaches and pears are extensively grown, the former producing fruit of superior color and flavor, but the yields are light and the orchards short lived. Tomatoes and sweet potatoes are the principal truck crops. They early reach maturity, but give smaller yields than on the sandy loam soils. Berries, asparagus, and all truck and garden crops are successful, the yields depending largely on cultivation and fertilization.

The Norfolk sand is a well-drained, warm, early soil, particularly adapted to trucking and market gardening, more especially to forcing special crops to early maturity for an advantageous market, and it should be intensively and exclusively cultivated to this class of crops. Unless low lying, wet, and in untypical condition it is poorly suited to

small grains and grass, although corn often does fairly well. Crimson clover does well, and should be more extensively grown and plowed under to improve the texture as well as the productiveness of the soil.

The occurrence of Norfolk sand in this area is too limited ever to reach the high importance it has attained elsewhere as an early truck soil.

The following table gives mechanical analyses of typical samples of the soil and subsoil of this type:

Mechanical analyses of Norfolk sand.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
9683	5¼ miles W. of Willow Grove.	Brown medium sand, 0 to 6 inches.	0.79	2.18	21.42	32.76	30.70	2.14	6.20	4.20
9681	Risingsun	Brown medium sand, 0 to 7 inches.	.36	2.62	24.60	27.80	25.38	4.62	8.84	6.26
9684	Subsoil of 9683.....	Yellow medium sand, 6 to 36 inches.	.35	2.38	27.24	29.22	29.52	1.68	7.50	2.36
9682	Subsoil of 9681.....	Yellow coarse sand, 7 to 36 inches.	.32	2.50	24.66	28.26	23.76	4.80	8.02	8.00

ELKTON CLAY.

The soil of the Elkton clay varies from 4 to 9 inches in depth, having a general average depth of 6 inches, and consists of a gray or brown heavy silt loam, usually very close textured and inclined to puddle and bake, forming large refractory clods when tilled in too wet a condition. When thoroughly dry the soil crumbles readily, has a chalky appearance and flourlike feel, sand particles being almost entirely absent.

The subsoil to a depth of 36 inches or more is stiff, mottled drab and yellow silty clay, plastic when moist, but friable when dry. The subsoil is usually of considerable depth, but is occasionally underlain at from 24 to 36 inches by a layer of fine sand, which is common to many of the types on this peninsula. However, the overlying materials are so impervious to the circulation of water that such areas are no better drained for the existence of this porous substratum.

It is locally known as "white clay" or "white oak land," having been originally heavily forested with white oak, but at present the natural growth consists of gum and several varieties of scrub oak.

The principal bodies of this type of soil are northeast of Dover

and east of Smyrna, while smaller areas occur near tide water and throughout the Norfolk silt loam in localities favorable to its formation. It is confined to the northern and eastern parts of the sheet.

The Elkton clay is one of the many types of the area which exist because of inadequate drainage. It occupies level, depressed, or low-lying positions adjoining the tidal marshes or around the heads of drainage systems, and ranges from tide level to some 30 or 40 feet in elevation. The change of elevation in any one area, however, is very slight. It is characterized by uniformly level surface features. The natural drainage is very poor, and ditching is usually necessary before cultivation can be carried on with any success. Underdrainage is not practiced, but is always necessary to bring this impervious type to its highest state of productiveness. It is naturally a cold, wet, sour soil, late to come into tillable condition in the spring because of water standing on the surface.

The materials which constitute this type were laid down in quiet waters and are among the finest of the sediments deposited during Pleistocene time. Gravels and coarse sand are lacking, which indicates uniform conditions of deposition. The natural processes of weathering have gone on only to a limited extent, being hindered by the saturated condition and lack of aeration of the soil. The mottling of the subsoil is due to unequal oxidation of the iron salts, while the textural differences in the soil are due to cultivation and the action of decaying organic matter.

Grass and wheat form the chief crop interests on the Elkton clay and yield large crops when the soil can be properly prepared, but the uncertainty of adequate returns causes the type to be held in low estimation by the farmers. Wheat yields of 25 or 30 bushels an acre can be produced, though the average yield is scarcely more than 10 or 12 bushels.

Grass lands on this type produce from 1 to 3 tons of clover and timothy hay per acre. In its present condition the type is best adapted to grass and small grains. Dairying and fattening of cattle are industries that might profitably receive more attention on farms composed in whole or in part of this soil. Tile underdrainage, heavy liming, and proper cultivation would much improve the texture of the soil and render large yields more certain.

The following table gives mechanical analyses of typical samples of this soil:

Mechanical analyses of Elkton clay.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
9679	3 miles N. of Leipsic.	Gray silty loam, 0 to 6 inches.	1.71	0.00	0.64	0.78	2.70	7.98	70.66	17.20
9677	2 miles S. of Little Creek.	Brown silty loam, 0 to 7 inches.	2.33	.38	1.18	1.18	2.14	3.90	73.00	18.20
9675	3½ miles NE. of Dover.	Brown silty loam, 0 to 10 inches.	2.74	.30	1.32	1.62	3.12	7.14	64.30	21.60
9678	Subsoil of 9677.....	Silty clay loam, 7 to 36 inches.	1.61	.00	.40	1.52	2.80	6.68	68.40	20.20
9676	Subsoil of 9675.....	Silty clay loam, 10 to 36 inches.	.41	.18	1.20	1.44	2.64	6.34	66.40	21.60
9680	Subsoil of 9679.....	Silty clay, 6 to 36 inches.	.62	Tr.	.44	.84	4.14	7.68	63.36	23.20

NORFOLK LOAM.

The Norfolk loam consists of a mellow brown sandy loam soil, having an average depth of 9 inches but varying from 6 to 14 inches, resting on a subsoil of heavier loam massive in structure and yellow to reddish-yellow in color, which is in turn underlain, usually at from 3 to 10 feet, by a layer of medium gravel or fine sand. The soil is friable and easily tilled, the subsoil less sandy and quite stiff and massive.

This type constitutes a light general-purpose soil, easily managed, and in this section is in a high state of cultivation. It is on this type that the peach industry of Delaware has been mainly developed. Though decidedly sandy, the soil acts more like a loam than most soils of similar composition, which is probably due to structural peculiarities. A large part of the type is cleared and under cultivation. What forest growth remains is principally oak of several varieties.

Its principal occurrence is in a broad belt running from north to south through the center of the area and lying on both sides of the railroad. Its western border is very irregular and deeply indented by areas of Portsmouth sandy loam. Large areas of Norfolk silt loam occur in the northern part of this belt, and considerable areas of Norfolk sand occur in it near the southern boundary, occupying a slightly higher elevation. Small areas of Norfolk loam occur frequently throughout the Portsmouth sandy loam in the western, but the type is almost entirely lacking in the eastern, part of the area surveyed.

Like the Norfolk silt loam, this type is found at all elevations from near tide level to the highest parts of the county, thus having a range of some 70 feet. Its most typical development is in the broad belt along the crest of the slope from the upland plateau to the forelands. Although the change in elevation is so slight as to be scarcely noticed, yet the fall is greater here, the streams run more swiftly, and natural drainage is better. This belt of Norfolk loam forms a sort of raised edge to the basin of Portsmouth sandy loam on the west, and its surface is marked by more rolling topography than is exhibited by the other types of this area, although much of it is very level and but little of it more than gently undulating.

The natural drainage on this type is very complete, except in a few unfavorable situations which are mostly uncleared. The soil is porous and mellow from the large amounts of sand it contains, and the subsoil, although allowing ready movement of water, is capable of retaining sufficient moisture for the needs of most crops. Underdrainage is rarely necessary to remove surplus moisture. The main part of the type is traversed by several large streams fringed by narrow areas of meadow land, which furnish power for many mills.

The Norfolk loam is the result of the intimate mingling of the coarse and fine sediments of recent Pleistocene time, brought about by the agency of water currents. It might be considered as the result of a thorough mixing of the materials of the Norfolk sand and Norfolk silt loam, as it has a texture about midway between them and consequently combines their characteristics.

Weathering processes have gone on to a greater extent in this type than any of the others, and being easily tilled it has been further modified in that way, so that the resulting soil is deep and of dark-brown color.

The Norfolk loam falls but little below the Norfolk silt loam in yields of corn, wheat, and other small grains, and even of clover, but timothy is but little adapted to it. Average yields are about 35 to 45 bushels of shelled corn, 15 to 20 of wheat, and 1½ tons of clover hay per acre. But in the production of truck, canning crops, and fruit, with the possible exception of apples, this type excels the heavier loam. Tomatoes are an important crop and the yields average 8 tons per acre, while some growers have secured as high as 15 tons per acre and many produce from 10 to 12 tons per acre year after year. Peaches and pears are the most prominent industries on this type. The former have long made this section famous. The fruit is of good size and color, and the trees healthy and long lived. Kieffer pears are fast equaling the peach orchards in extent and many growers have realized handsome profits from this fruit.

Alfalfa is successfully grown, though it is rather difficult to secure a full stand. Four cuttings may be made in this favorable climate, and this crop deserves more attention on account of its beneficial effects in

maintaining the productiveness of the soil. Asparagus is an important crop. Cowpeas and crimson clover are much used as cover and forage crops, especially in the orchards. Berries of all kinds also do well.

The peculiar fitness of the Norfolk loam to the above-mentioned crops has long been recognized here, and but little is left to be suggested in the matter of crops for this soil type, except along these same lines. It is highly developed, and improved farms bring high prices, with but few desirable locations for sale.

This soil is admirably suited to a highly specialized system of farming, and general farm crops should be gradually abandoned to more profitable special ones.

The following table gives mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Norfolk loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
9702	1½ miles NW. of Leipsic.	Brown sandy loam, 0 to 10 inches.	1.16	2.60	14.80	18.10	21.02	5.38	29.52	8.46
9700	1 mile E. of Blackiston.	Sandy and silty loam, 0 to 9 inches.	.74	3.80	15.18	17.98	14.30	5.40	32.20	10.38
9704	1 mile W. of Dover.	Fine sandy loam, 0 to 8 inches.	.82	2.60	16.82	11.66	12.96	6.08	36.96	12.22
9703	Subsoil of 9702.....	Sandy loam, 10 to 30 inches.	.12	1.06	14.56	21.00	24.46	4.50	22.06	11.50
9701	Subsoil of 9700.....	Yellow sandy loam, 9 to 36 inches.	.16	4.22	18.42	20.02	15.86	4.80	20.16	16.04
9705	Subsoil of 9704.....	Yellow sandy loam, 8 to 36 inches.	.23	4.34	16.90	13.80	18.80	5.60	19.86	20.70

NORFOLK SILT LOAM.

The Norfolk silt loam is a soil type of wide distribution over the northern Atlantic Coastal Plain, although of small extent compared with associated types.

The soil to an average depth of 8 inches is a mellow brown silty loam, holding a small proportion of medium and fine sands, which give it the mellow character, but consisting for the most part of silt. It is free from stones or gravel except in small areas along stream banks. The subsoil from 8 to 36 inches is a massive yellow loam, in which silt is very prominent, and which is so stiff that the type is locally known as "red clay land." The color, however, is more generally yellow. The subsoil is usually underlain at a depth greater than 3 feet by a stratum of fine sand from a few inches to several feet in thickness, and less often by a narrow band of rounded gravel.

The Norfolk silt loam occurs in a large, irregular area east of Dover, extending down the necks of land to the tide marshes. This area is separated by Little Duck Creek from another large area north of Leipsic. Many areas of irregular outline and separated by narrow belts of other soil types extend from Smyrna westward to the State line. Other small bodies of the type are widely scattered throughout the northern half of the county, and many hammocks in the tide marshes consist of this soil.

This soil occupies all elevations from tide level to the highest in the area, which is only about 70 feet, but is best developed on the long necks extending into the tidal flats and on the slope of the broad terrace which constitutes the entire breadth of the State at this point. Its surface features vary from level to very gently rolling, but are more diversified than in any of the other types found here, except Norfolk sand and Norfolk loam.

The greater part of the type possesses adequate natural drainage, both by reason of its structure and of the more porous, sandy, or gravelly layer which underlies it at no great depth. Where these conditions are lacking and in depressions Elkton clay is usually found.

The Norfolk silt loam is undoubtedly derived from the sediments which form the Elkton clay and owes its marked differences to better drainage, aeration, and weathering, augmented by thorough cultivation and the incorporation of organic matter, fertilizer, and lime. What has been said concerning the age and manner of deposition of Elkton clay applies equally to Norfolk silt loam. The contrast between these two types in field appearance and crop adaptation is very striking, considering their close textural relation, and these differences must be ascribed largely to structure and consequent differences in their behavior toward the movement of soil moisture.

At present the chief crop interests on this type are corn, wheat, and grass—or general farming—and of less importance are pears, tomatoes, and asparagus. The average yields per acre on the whole type are 50 bushels of shelled corn, 20 bushels of wheat, and 1½ tons of hay, although 70 to 80 bushels of corn and 40 bushels of wheat are sometimes secured in favorable seasons. Kieffer pears are extensively and profitably grown, but not so extensively as on the sandy loam. Other varieties suffer too severely from blight to be profitable. Quite a number of fine peach orchards were observed on this soil, but it is not as well suited to this fruit as the Norfolk loam or the Norfolk sand. Asparagus is grown extensively, the fields ranging from one-fourth acre to 2 acres in extent.

The Norfolk silt loam is well suited to general farming and to a wide variety of truck and canning crops, especially late varieties and those requiring a long growing season. It is an ideal apple soil for those varieties suited to this latitude, such, for instance, as the Winesap.

Stock raising and dairying should be more general, and less reliance

should be placed on commercial fertilizers. Irish potatoes do well and should furnish a source of profit, as they mature early in this climate. A few sweet potatoes are grown on this soil, but they do not yield as well as on the sandier types.

This is the most desirable general farming soil of the area and has been brought to a high state of cultivation here, improved farms bringing from $50 to more than $100 an acre.

Smaller farms and more intensive methods of cultivation, with a gradual abandonment of wheat as a money crop, would tend to increase even the high value this type already has.

The following table shows the texture of the soil and subsoil of this type:

Mechanical analyses of Norfolk silt loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
9694	2 miles S. of Kenton.	Brown silty loam, 0 to 8 inches.	1.83	1.70	8.12	8.06	14.38	8.64	45.32	13.70
9696	3¼ miles N. of Little Creek.	Brown silty loam, 0 to 8 inches.	.64	1.56	7.96	7.94	7.98	7.36	51.90	15.02
9692	1 mile N. of Blackiston.	Brown silty loam, 0 to 8 inches.	2.37	1.50	6.52	6.32	9.52	9.62	45.96	20.46
9697	Subsoil of 9696.....	Brown silty loam, 8 to 30 inches.	.85	1.64	6.78	6.94	6.50	7.22	51.04	19.18
9695	Subsoil of 9694.....	Yellow loam, 8 to 30 inches.	.38	.74	5.28	5.54	12.74	8.72	46.00	20.64
9693	Subsoil of 9692.....	Yellow loam, 8 to 36 inches.	.45	1.00	7.40	7.04	9.40	5.26	44.76	25.28

GALVESTON CLAY.

The soil of Galveston clay to a conventional depth of 12 inches is a brown or drab silty clay loam, full of roots and humus, very compact and plastic, and continually saturated with water by the tides.

The subsoil to more than 36 inches is a heavy drab silty clay, holding some roots and organic matter. Where exposed, as in dikes and embankments, the subsoil bakes hard and cracks like a heavy clay.

Much of the type in this area is covered with a compact mass of roots, saturated with water, and does not afford a solid footing. Such areas are sometimes called "loose land," while that which is firm enough to afford a footing is called "mowing marsh." However, these terms are used promiscuously and do not always have the above meaning.

Galveston clay is the name given the tide marsh in this locality. It extends as a wide belt along the entire eastern boundary of the area, with an average width of about 3 miles. It extends as far up the

larger streams as the salt water penetrates with every flood tide. It is essentially a low-lying, level-surfaced type, and has a range of elevation not exceeding a few feet. Its level, treeless surface is a very characteristic feature. Natural drainage is entirely lacking, except for a few hours daily at low tide. All the Atlantic drainage streams of the area traverse the type, but furnish no drainage to the tide marsh. At one time a large section of this land east of Smyrna was diked in an attempt to reclaim it, but the undertaking proved to be too expensive in proportion to the value of the land, and the dikes have been abandoned and the land given up to the tides. Much of the type is more favorably situated for reclamation at slight expense, and when the demand for land shall become greater there is no doubt that most of it will be drained and eventually become a valuable part of the cultivated lands of the area.

Galveston clay represents the most recent sediments, and is continually being built up at the present time in shoal waters along the coast, where unexposed to the full force of the currents or waves. It consists chiefly of clay and silt, and has undergone little change since deposition. The rank vegetable growth has modified the surface and an excess of humus has accumulated.

This soil type is not cultivated and supports a heavy growth of salt-water grasses and reeds. Many of these are of value. Good "bent hay," as it is called, brings about $5 a ton, delivered at shipping points. The "black grass" is considered good hay for horses, "three square" is cut for bedding, being very porous, and other grasses are used for a variety of purposes, such as rope making, core making in foundries, and crockery packing.

The following table shows the texture of samples of this soil.

Mechanical analyses of Galveston clay.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
9673	2 miles SE. of Little Creek.	Dark silty loam, 0 to 12 inches.	9.04	1.20	6.30	8.12	18.42	6.06	36.84	23.00
9671	4 miles N. of Little Creek.	Silty clay loam, 0 to 12 inches.	1.84	2.00	10.10	8.60	10.70	11.70	33.20	23.30
9669	Bombay Hook.....	Silty clay loam, 0 to 12 inches.	3.37	.52	4.10	5.18	9.50	3.20	38.50	38.92
9672	Subsoil of 9671.....	Gray silty clay, 12 to 36 inches.	1.37	1.40	6.76	7.56	9.90	13.38	41.10	20.00
9674	Subsoil of 9673.....	Silty clay loam, 12 to 36 inches.	2.32	1.70	6.50	8.00	16.70	6.50	40.20	20.44
9670	Subsoil of 9669.....	Drab clay, 12 to 36 inches.	2.35	.10	.56	.68	2.56	2.06	41.40	52.52

SWAMP.

The term Swamp has been applied in this area to lands filled with standing water and perpetually submerged, so that no idea of their texture could be obtained. They occur along the larger streams adjoining tide marsh, and are covered with backwater at each high tide.

They support a dense growth of cypress and gum, and are almost impassable except by canoe at high tide. They are of no value except for the timber they contain, and it is very doubtful if they will ever be reclaimed.

MEADOW.

Low-lying, wet strips of land along the streams and subject to overflow have been classed as Meadow. The soils of such areas have no definite texture, and they are grouped mainly according to moisture conditions.

The soil is perhaps most often a dark-brown, heavy silt loam about 10 inches deep, wet, and undrained. The subsoil is variable, but is usually a coarse, sticky sand and gravel.

The Meadow is widely distributed, but of small extent and very unimportant in its bearing on agriculture. It represents the small flood plains of the lesser streams, is semiswampy in nature, and usually covered with a dense growth of shrubs, among which the magnolia is prominent.

It is uncultivated and used mainly as pasture for cattle, sheep, and hogs.

GALVESTON SAND.

The Galveston sand consists of a light-gray, medium rounded sand with a depth of more than 3 feet, there being no distinction between soil and subsoil. It is uniformly loose and incoherent in texture.

It occurs in this area in two small areas—one at Kitts Hammock, the other at Bowers Beach—and is the familiar beach sand of the Atlantic coast. It contains scarcely a trace of plant food and is devoid of vegetation.

The extent of the type in this area is too small to call for further discussion.

AGRICULTURAL METHODS.

The cultivation of corn and wheat in Kent County does not materially differ from the usual practice in the middle South. Plowing, as a rule, is shallower than in more northern areas, but deeper than common in the far South. The depth ranges from 3 to 6 or 8 inches, inclining toward the greater depths, except where wheat follows corn, when the seed bed is usually prepared with disk harrows. Because of this method of preparation the disk drill seems to be largely preferred to the hoe drill.

Much of the corn crop is cut, shocked in large rows, and husked in the field, while the intervening ground is prepared and seeded in wheat. Some corn is topped, the blades stripped, and the ears husked from the stalk, leaving the heavy stalks to be cut and removed or burned before the succeeding crop. This practice is more general on those farms producing insufficient hay for the stock, the blades being highly prized as a hay. On the whole, the method is wasteful of labor and material, and should be abandoned.

A lately introduced and already widespread practice consists of sowing crimson clover in the corn at the time of last cultivation, at the rate of 10 or 15 pounds per acre. It makes a rapid growth, giving a good cover crop over the winter season, conserving moisture and enriching the soil in nitrogen. Early in the spring it may be utilized as hay or returned to the soil as green manure. It is of marked benefit unless allowed to make too great a growth before being turned under, in which case it decays slowly and is apt to make the soil dry out too rapidly.

Wheat usually receives an application of from 200 to 400 pounds per acre of some commercial fertilizer in addition to its share of the manure produced on the farm. The fertilizer is usually drilled in with the grain in the fall. Phosphate and potash mixtures and phosphate rock are chiefly used, relying on leguminous crops and other sources to maintain the supply of nitrogen. The crop is harvested with binders, thrashed, and the straw stacked, and either fed to stock or baled and sold.

Strawberries are cultivated in a matted row, set in early spring, cultivated every week or ten days during summer, and given 5 or 6 hand hoeings. The best growers use 300 or 400 pounds of dissolved bone before setting, and in the fall apply 500 or 600 pounds of some potash and phosphoric acid mixture, and in the spring 100 pounds of nitrate of soda on top of the row.

Many systems of rotation are used to suit the different soils, farming interests, and fancies of the grower. A common practice is to turn sod, plant wheat two seasons, corn two seasons, seeding to grass the last time, cutting one crop of hay and pasturing the next, making a six-season rotation, two each in grass, wheat, and corn. Where other crops enter the system the rotation is subject to wide variation.

The dairy farms use soiling and silage crops extensively. Cowpeas are a favorite in the peach and pear orchards. Rotation is but little practiced in the marsh soils of the upland, and many fields have produced corn continuously without fertilization; and much of this land has been reduced to a poor state of production by injudicious cropping and cultivation.

Superficial drainage furrows are plowed out in the Portsmouth

sandy loam to hasten surface drainage, while the Elkton clay is plowed in narrow lands for the same purpose.

The Lucretia dewberry is a favorite berry crop. It is trained on wires strung on posts rising from 18 inches to 2 feet above the ground and placed 2 rods apart, the vines being trained in each direction from the post and tied to the line wires.

AGRICULTURAL CONDITIONS.

The agricultural population of Kent County, Del., are favored with an equable climate free from the rigors of a northern winter and the excessive heat of a southern summer, with an abundance of fish and sea food drawn from the bay, with lands level, easily tilled, and responding generously to cultivation. They gain a good living with the minimum of effort. Many pride themselves that they are living on farms which have remained in the family for generations. Many have become wealthy from the practice of agriculture here, and everywhere in the area one sees evidence of prosperity and thrift. Even among the tenant class the average of intelligence seems high. The colored population is peaceable and contented and in advance of a majority of their race.

The farm buildings usually consist of a comfortable two-story frame or brick dwelling, stock barns, tool sheds, granary, etc. The winter climate is so mild that the large barns so common farther north for the storage of all crops are not required, and but few are seen. Where large barns are found, dairying is usually the principal occupation, and in this industry silos are also quite commonly used. Few of the farms are fenced, but where fences exist they are commonly of some of the improved wire constructions.

Many of the farms are worked by the owner, or directly under his supervision, by both white and colored labor, but perhaps a greater number are rented to tenants for a share of the crops, the owner furnishing fertilizer and exercising some authority as to the acreage of each crop. Many tenants have successfully worked the same farm for many years, and the system seems to have worked to better mutual advantage here than in many other localities.

The farms vary in size from a few to a thousand acres, and there are many of 400, 600, and 800 acres. The general average would be somewhere between 200 and 400 acres. There is a growing tendency to further subdivision of the older and larger estates, and the number of the smaller farms is increasing. The larger farms are nearly all located on the Norfolk silt loam and the Norfolk loam, while the newer settled western portion of the area is divided into smaller holdings, usually worked by the owner and his family. The tendency toward smaller farms is necessitated by the scarcity of efficient labor,

and will result in a great specialization of crops, with marked benefit to the agricultural and general prosperity of the section.

Farm labor is both white and colored, the former being very scarce and commanding good wages, while the latter of efficient character is scarce, as the best of this class own and manage small farms. The labor problem has become so acute that steps have been taken by the State board of agriculture and by private individuals to secure relief from the Immigration Bureau, and good inducements are held out to prospective settlers and home seekers.

Among the principal products of this section peaches hold an important position. Delaware has long been favorably known for the quality and quantity of this luscious fruit which she produces, and Kent County is in the very heart of the producing section. From Smyrna on the north to Woodside on the south the peach orchards are nearly continuous over the broad belt of Norfolk loam, and to a less extent on some of the other types. Nearly all the peaches are grown on the Norfolk loam, the Norfolk silt loam, and the Norfolk sand, but at least three-fourths are found on the first-mentioned soil. Since its early inception the industry has undergone many vicissitudes of disease and pest only to emerge more strongly and firmly established. The appearance of the dreaded yellows some years ago threatened it with great disaster and many fine orchards were ruined and the center of the industry steadily moved southward before its encroachments. The disease was stubbornly fought by the State board of agriculture and the State experiment station in cooperation with the leading growers, and it is now practically stamped out, or at least is so dormant that it is little feared by the growers. The laws in regard to it are stringent and thoroughly enforced, so that it is eradicated immediately on its appearance.

Of the many varieties of peaches grown the Elberta easily takes the lead. The Crawford Late and the Townsend are prominent among the yellow-fruited varieties. The Mountain Rose and Old Mixon are favorites, maturing a little earlier than Elberta. The Belle of Georgia is a recently introduced and very prolific variety. The Crawford and the Reeves are prominent old varieties, while prominent among many recent ones are Bilyeu's Comet, Mamie Ross, Carmen, and Reilly. The north China varieties are growing in favor, and even the Early Crawford will soon be abandoned.

Among the fruits the Kieffer pear stands next to the peach in importance and is rapidly rivaling it in area of orchards. It is a rapid grower, an early and prolific bearer, and has returned handsome profits to the producer. Up to the present season it has successfully withstood the blight, but it was badly affected in 1903 by this disease and the crop nearly ruined, which leaves the future of this industry somewhat in doubt. Other standard pears are too easily affected by

blight to last long in this locality, and but few orchards are seen. Le Conte has been a favorite variety, and should some means of checking the ravages of blight be discovered it would be grown extensively. The peach industry at present is in very active condition, and many large orchards are being set.

Of the small fruits the Lucretia dewberry is important, and is a very profitable berry. Anthracnose has been very disastrous to it, but a little spraying effectually prevents this disease, and the acreage is rapidly increasing. Plums, particularly the Japanese varieties, do well and are attracting considerable attention.

Tomatoes are the most important canning crop, and a large acreage is devoted to them, particularly on the sandy soil types. The yields vary from 4 or 5 tons per acre on the poorer soils to 10 or 12 tons on the better. The tomatoes are sold to local canneries, bringing about $8 a ton. Some growers contract the entire crop, while others sell by the basket at the prevailing price. Tomatoes, as well as peaches and pears, are harvested in baskets holding five-eighths of a bushel, and drawn to the canneries in especially constructed wagons, peculiar to this part of the country.

The principal crop interests of the heavier soils are corn, wheat, and grass. Some hay is baled and shipped, but a large amount is being fed to stock, which results in a considerable saving to the land.

Sweet potatoes are largely cultivated on all the sandy soils and do particularly well on the Norfolk sand and the Norfolk loam. Irish potatoes are also successfully grown, and this crop is deserving of more attention as a source of profit, as it can be matured early enough to secure a high price in the city markets farther north.

The total acreage of asparagus is large, and this is a very profitable crop, although one requiring considerable labor. Strawberries have been successfully grown on the black swamp lands farther south on the peninsula and should be widely grown on the Portsmouth sand and the Portsmouth sandy loam. It is thought that celery and onions might be grown with profit on the more mucky areas.

Apples are prolific and profitable on both the Norfolk loam and the Norfolk silt loam. Of the various crops which make up the agricultural industries of this section, each reaches its best development on some one particular soil type, and sometimes only on some favorable location on a type. This adaptation of soil to crop has been well recognized in this area and very generally utilized. The largest peach orchards are found on the Norfolk loam, the largest wheat fields on the Norfolk silt loam, the most extensive grass lands on Elkton clay, etc. The Portsmouth types are less highly developed, and in the preceding paragraph some indication has been given of the special crops most likely to prove profitable on these lands in their present condition.

The northern half of Kent County is traversed by two branches of the Pennsylvania Railroad entering the area at Clayton on the north. The main line leaves the area between Woodside and Viola, the branch line at Marydel, on the western boundary. The line from Bombay Hook to Clayton has been abandoned in this State for many years. Steamer lines make several sailings a week from Smyrna to Philadelphia and from landings along St. Jones Creek to the same place.

The county is traversed by many roads, having a rather intricate system, but the level surface features and character of the soil materials enable them easily to be kept in repair, and they are in fair condition for dirt roads. The traveler can readily drive a distance of 40 miles in a day without undue fatigue to his horse. The roads traversing the tidal marshes are hard to construct and difficult to keep in repair. Many of them were impassable at the time the survey was made, owing to a recent heavy storm. Delaware possesses a decided advantage over the mountain fruit sections, in that tender fruit can be drawn to the shipping point over the level, stoneless dirt roads with the minimum amount of damage. Many houses are located at a considerable distance from the highway and are reached by private lanes, which are not shown on the map, except where it was necessary to survey them to aid in locating soil boundaries.

The area is well provided with both rail and water transportation, and is conveniently located with respect to the large markets of Baltimore, Philadelphia, and New York, all of which are but a few hours distant by rail. Philadelphia is easily reached by water, which furnishes a cheap mode of transportation especially desirable for fruits which are liable to injury from shipment by rail. With all these advantages the fruit and trucking industries should make rapid advancement.

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U.S. DEPT. OF AGRICULTURE
BUREAU OF SOILS
MILTON WHITNEY, CHIEF

SOIL MAP

DELAWARE
DOVER SHEET

SOIL PROFILE
(3 feet deep.)

Norfolk sand — S / S
Portsmouth sand — S / S
Portsmouth sandyloam — Ssc / C or S / S
Norfolk loam — Ssc / Ssc
Norfolk silt loam — Sc / Sic
Elkton clay — Sicc / Scc
Galveston clay — Sicc / Scc
Galveston sand — S
Meadow — Sicc / S or Gr

LEGEND

S Sand
Ssc Sandy loam
C Sandy clay
Sic Silt loam
Sc Loam
Sicc Heavy silt loam
Gr Sand and gravel

LEGEND

Ns Norfolk sand
Ps Portsmouth sand
Pl Portsmouth sandyloam
Nl Norfolk loam
Nsl Norfolk silt loam
Ec Elkton clay
Gc Galveston clay
Gs Galveston sand
M Meadow
Swamp

Soils Surveyed by
F. E. Bonsteel and O. L. Ayrs
1903

Scale 1 inch = 1 mile

Field Operations
Bureau of Soils
1903